ANNUAL REPORT 1964

PORT COLBORNE

water pollution control plants

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Port Colborne Local Advisory Committee,
Town of Port Colborne.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Port Colborne Water Pollution Control Plant, OWRC Project No. 59-S-47.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Port Colborne Water Pollution Control Plant, OWRC Project No. 59-S-47 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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PORT COLBORNE

water pollution control plants

operated for

THE TOWN OF PORT COLBORNE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

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L. E. Owers

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W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. Beattie
Operations Engineer: P. J. Osmond

801 Bay Street — Toronto 5

'64 REVIEW

This report provides detailed information on the operation of the various treatment units at the Port Colborne Water Pollution Control Plants.

During the past year secondary treatment was provided for 425.5 million gallons of sewage. This represents a total increase of 26.5% over the 1963 total plant flows. The flow increase at the West Side Plant was 30.2% and at the East Side Plant the increase was 18.3% over the 1963 flows.

The effluent discharged by both plants during 1964 was satisfactory. The average removal efficiencies for BOD and suspended solids was 90.5% and 94.0% respectively for the West Side Plant and 87.0% and 85.0% respectively for the East Side Plant.

The operating costs for the project during 1964 decreased in all respects from the previous year. The total operating costs decreased almost 5%, the cost per family decreased 17.6%, the cost per million decreased 24.7% and the cost per pound of BOD removed decreased 19%. These decreases in operating costs were due primarily to the increase in flow and the fact that no major equipment replacement or repair and maintenance costs were incurred during the year.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1959 – 1964

In 1959, the Town of Port Colborne and the Ontario Water Resources Commission initiated plans for the construction of the West Side Sewage Treatment Plant. This new activated sludge plant was placed in operation in November 1961, and officially opened on July 25th, 1962.

On June 1st, 1961, at the request of the Town of Port Colborne, the Division of Plant Operations of the Ontario Water Resources Commission took over the operation of the existing sewage system comprised of the Killaly Street and King Street plants and seven pumping stations. At the same time four members of the Town staff were transferred to the OWRC staff.

At the end of 1962, the Clarke Street pumping station was placed in service. This station is part of Project No. 60-S-73 which also includes a forcemain to the Killaly Street plant and sanitary sewers.

The summer of 1963 saw the incorporation of the Fretz Park pumping station, Project No. 62-S-108, into the system. This new station serves the southeast portion of the town and replaces the old Colborne Street station.

During the fall of 1964 tenders were called for the construction of sewers and two pumping stations, Project No. 62-S-100, to service the northwest area of the town. Construction is to commence early in 1965.

JIM TELFER
CHIEF OPERATOR

Project Staff

Operators

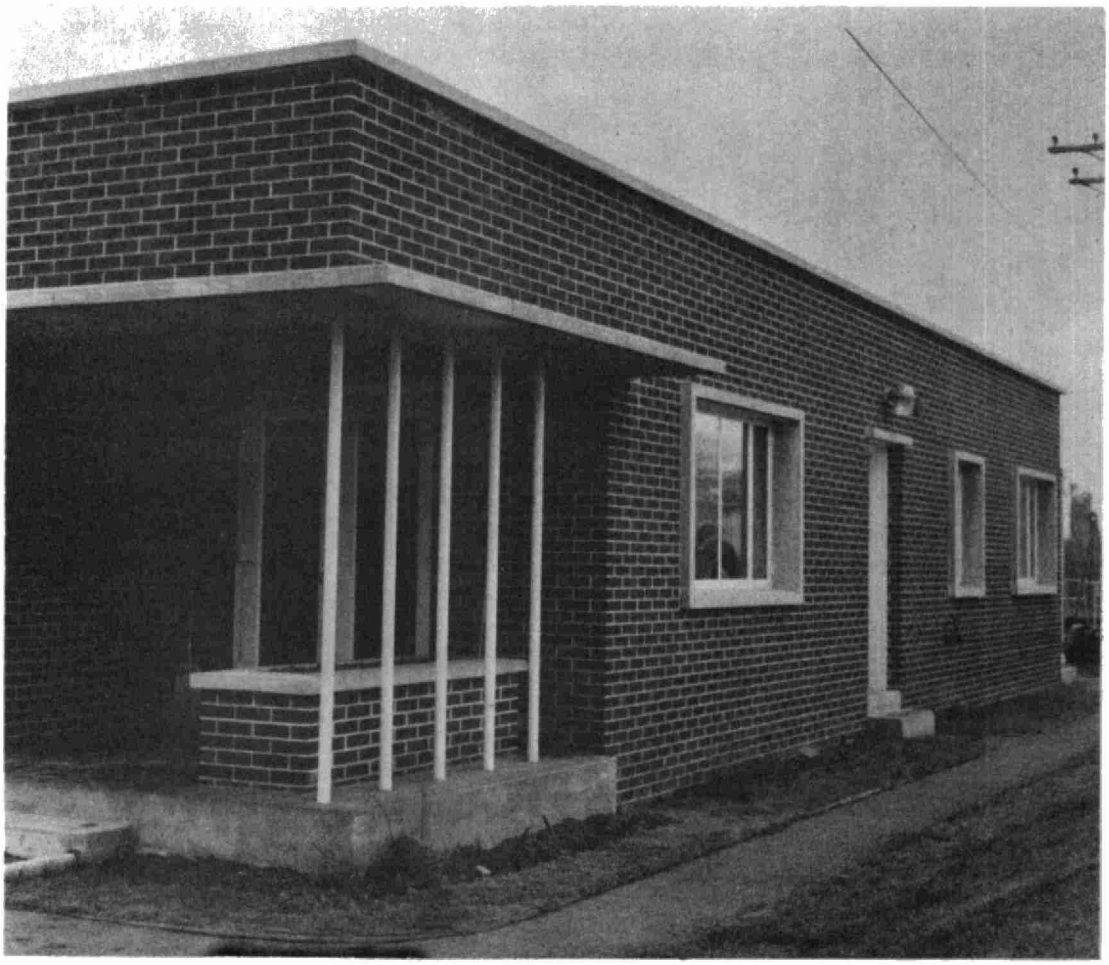
M. Baggio	J. Bilodeau
C. Root	J. Sieber
S. Toth	E. Young

Mechanic: J. Blanchard

COMMENTS

There were no additions or deletions to the staff during 1964.

Throughout the year courses and conferences are provided by the OWRC in Toronto for training in the operation of sewage treatment plants. Two of the staff completed a series of three of these courses and one of them Mr. Blanchard received his Certificate of Qualification as a Sewage Works Operator.



CONTROL BUILDING (WEST SIDE PLANT)

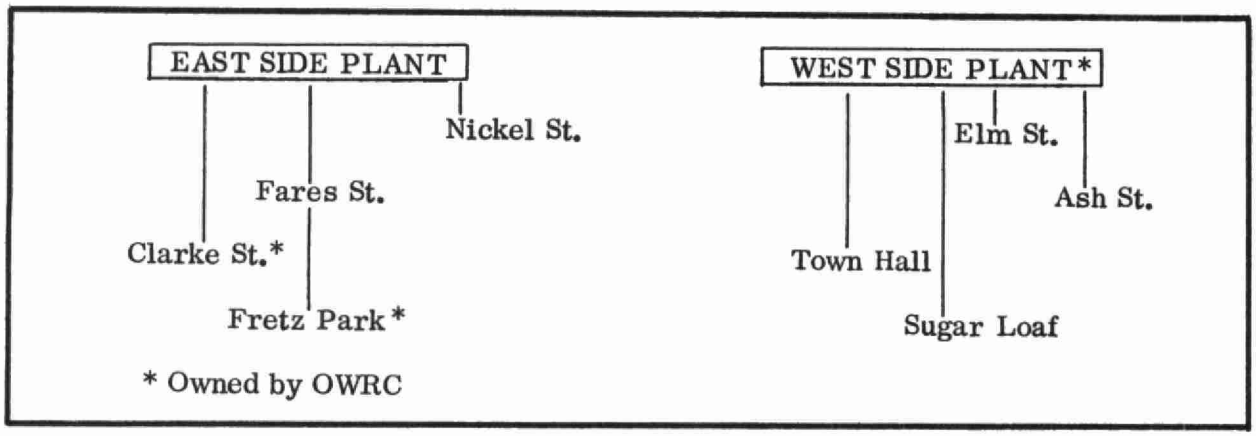
Description of Project

SUMMARY

The geographical location of the Town of Port Colborne and the relatively shallow soil conditions over the underlying bedrock have resulted in the necessity of two sewage treatment plants and an integrated system of pumping stations. The Welland Canal divides the town into two sections, the east side and the west side. Each side is served by a treatment plant which is served in turn by four pumping stations. The entire project is operated by the OWRC.

The diagrammatic layout indicates the treatment plant and the pumping stations serving each plant. An asterisk behind the name indicates ownership by the OWRC.

The description includes both the west side and each side plants. However, due to the multitude of pumping stations involved in this project, only the two newest, Clark Street and Fretz Park, are described in this report.



WEST SIDE SEWAGE TREATMENT PLANT (KING STREET)

GENERAL

The plant is located at the intersection of King and Keefer Streets. It treats the sewage for the section of the town on the west side of the Welland Ship Canal.

The sewage is pumped to the plant by four outlying pumping stations located at Ash Street, Elm Street, Sugar Loaf Street and near the Town Hall.

INFLUENT WORKS

The waste water enters the plant via a 14 inch diameter inlet sewer, passing through one of two manually cleaned bar screens, into the grit channels.

The bar screens prevent large objects from entering the plant. In the grit channels, the velocity of flow is reduced sufficiently to allow settling of the heavier particles of grit and detritus material which otherwise would damage the plant. These channels are operated alternately to allow cleaning of one while the other is in use.

From the grit channels, the flow passes through a Venturi flume, which measures the flow entering the plant and into the primary distribution chamber.

PRIMARY SETTLING

The two circular primary settling tanks receive the waste water from the distribution chamber, which proportionately distributes the flow equally between the two tanks.

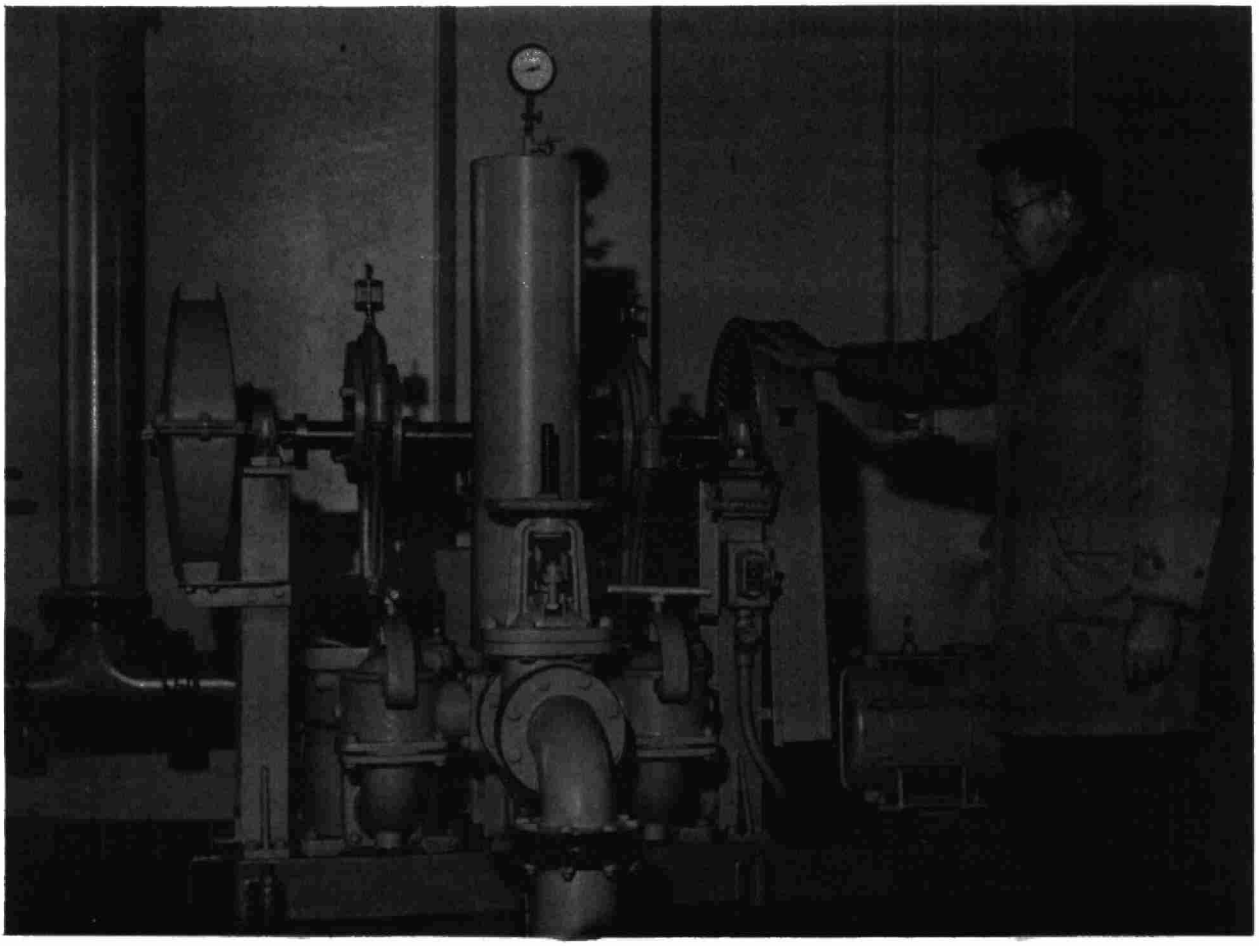
These tanks provide a detention period to the flow and allow the heavier organic material (sludge) to settle for removal. The tanks are equipped with sludge scraping and surface skimming mechanisms which draw off the accumulated sludge and scum, depositing the material in a holding pit from where it is pumped to the primary digester for treatment.

The partially settled flow then passes over the effluent weirs to the aeration tanks.

AERATION

The six aeration tanks provide the biological environment required to remove the finely divided, suspended and dissolved organic materials remaining in the flow.

The settled sludge (activated sludge),



JIM TELFER INSPECTS DIGESTED SLUDGE PUMP AT WEST SIDE PLANT

from the final settling tanks, is recirculated back to the aeration tanks and mixes with the effluent from the primary tanks. The mixed liquor is then aerated by the high intensity aerating cones which supply, by their agitating action, the oxygen requirements of the biological communities of aerobic micro-organisms (sludge floc).

(The activated sludge which is returned, acts as the vehicle for the bacteria which in turn oxidizes the organic material).

The mixed liquor then passes into the final distribution chamber.

FINAL SETTLING

The two circular final settling tanks receive the flow from the distribution chamber and provide another detention period to the mixed liquor, for removal of the activated sludge. The tanks are equipped with sludge removal facilities which draw off the activated sludge and return it to the aeration tanks or to waste.

The clarified effluent is then discharged over the effluent weirs to the chlorine contact chamber.

CHLORINATION

The chlorine contact chamber provides another short detention period to ensure overall contact with the chlorine, which is piped in from an automatic proportional chlorinator. The chlorine disinfects the effluent by destroying any remaining bacteria.

The effluent is then discharged to the Welland Canal.

DIGESTION

The digestion in this plant is performed in two stages; called primary and secondary digestion.

The sludge from the primary settling tanks along with waste activated sludge is pumped to the primary digester. In the absence of air, and at a temperature of 90 degrees Fahrenheit, the decomposing or digestion process begins. The sludge is broken down by bacterial action to a thick, black, odourless liquid. Constant mixing ensures overall treatment.

The secondary digester receives the digested sludge and completes the process. This digester is not agitated but is left in a quiescent state. The supernatant is decanted and returned to the treatment process and the settled digested sludge is pumped out and trucked away for disposal.

During the digestion process, sludge gas (principally methane) is formed and is used as a fuel for the boiler, supplying heat to the buildings and digesters. Standby fuel is oil.

EAST SIDE SEWAGE TREATMENT PLANT (KILLALY STREET)

GENERAL

The plant is located near the intersection of Killaly Street and Welland Street. It treats the sewage for the section of the town located on the east side of the Welland Ship Canal.

The plant is fed by four outlying pumping stations; Fares Street, Nickel Street, Clarke Street and Fretz Park.

AERATION SECTION AT WEST SIDE PLANT

INFLUENT WORKS

The waste water enters the plant via two 10-inch forcemains passing through one of two manually cleaned bar screens into the grit channels.

The bar screens prevent large objects from entering the plant. In the grit channels the velocity of flow is reduced sufficiently to allow settling of the grit and detritus material which otherwise would damage the plant. These channels are operated alternately to allow cleaning of one while the other is in use.

The flow then passes through a comminutor which further screens the sewage and cuts the screenings into fine particles. It then passes through the screen openings and to the aeration section.

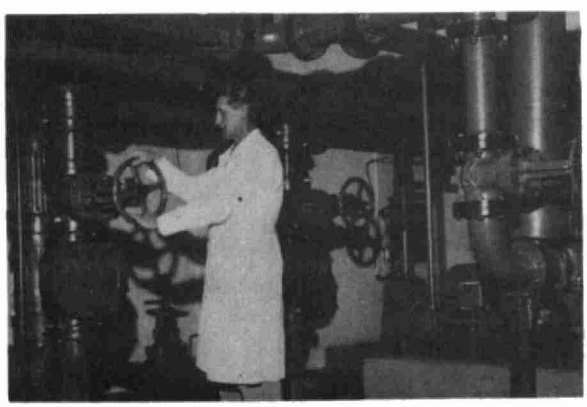
The sewage flow is measured as it passes through a Parshall flume.

AERATION

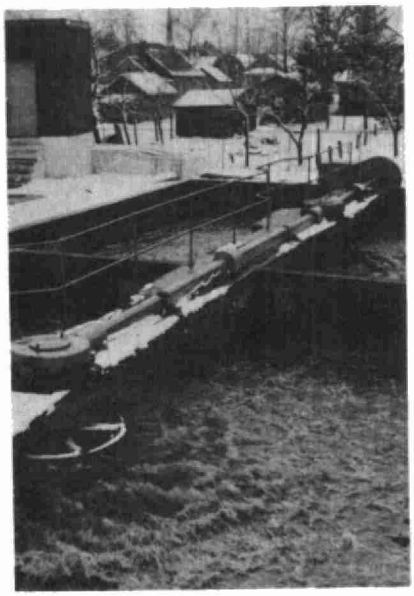
The four aeration tanks during a detention period provide a biological environment as was described for the King Street plant. The mixed liquor then flows to the final settling tanks.

FINAL SETTLING

Two circular final settling tanks receive the flow and provide another detention period for the removal of activated sludge. The tanks are equipped with sludge removal facilities which return the activated sludge to the aeration tanks or waste. The clarified effluent then discharges over the weirs.



RETURN SLUDGE PUMPS (WEST SIDE PLANT)



AERATION SECTION, EAST SIDE PLANT

DIGESTION

The digestion in this plant is carried out in one stage.

The waste activated sludge is pumped into the digester. In the absence of air, and at a temperature of 90 degrees Fahrenheit, the decomposition and digestion takes place.

The supernatant is decanted and returned to the plant and the digested sludge is hauled away by tank truck.

CLARKE STREET PUMPING STATION

GENERAL

This pumping station is located on Clarke Street between Russell Avenue and Killaly Street East and serves the northeast section of the town. Sewage is collected in the wet well at the station and is delivered via a forcemain to the influent channel at the East Side plant.

EQUIPMENT

This station is equipped with three stereophagus pumps which may operate singly or in parallel depending upon the flow of sewage into the station. These pumps are equipped with a conical impeller and combine a shredding and pumping operation which eliminates the need of comminution facilities at the East Side plant.

The pumps operate on a simple on-off basis and are controlled by the level in the wet well, this level being sensed by electrodes set at appropriate elevations.

There is no standby power in the event of a local electric power failure. To avoid surcharging of the sewers in such an instance, an overflow pipe has been provided leading from the wet well to a nearby ditch.

FRETZ PARK PUMPING STATION

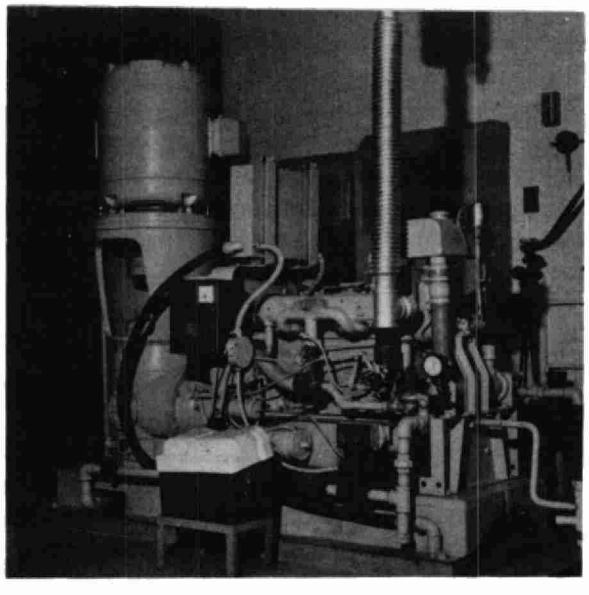
GENERAL

Located on Johnston Street between James and Mercury Avenue, this pumping station serves the southeast section of the town. Sewage is collected in the wet well at the station and is delivered via a forcemain to the influent channel at the East Side plant.

EQUIPMENT

This station is equipped with two stereophagus pumps which may operate singly or in parallel depending upon the flow of sewage. These pumps, as do those in the Clarke Street station, combine a shredding and pumping operation. The pumps are controlled by electrodes located in the wet well.

In the event of a power failure, rather than an overflow pipe as is provided at the Clark Street station, a standby natural gas engine has been installed. This engine starts automatically in the event of an interruption in the local hydro and by means of a right angle drive mechanism, serves as power to one pumps until service is resumed.



PUMP AND STANDBY ENGINES AT
FRETZ PARK PUMPING STATION

PROJECT COSTS

59-S-47

LONG TERM DEBT: (Total Capital Cost)	$625,008.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 57,818.45
Debt Retirement	12,613.00
Reserve	4,603.00
Interest Charged	35,163.17
TOTAL	$110,197.62

RESERVE ACCOUNT

Balance at January 1, 1964	$ 9,663.04
Deposited by Municipality	4,603.00
Interest Earned	629.84
	$ 14,895.88
Less Expenditures	-
Balance at December 1, 1964	$14,895.88

DEBT OUTSTANDING:	$585,185.99

LONG TERM DEBT: (Total Capital Cost)	$278,046.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ -
Debt Retirement	20,507.49
Reserve	2,391.00
Interest Charged	15,563.06
TOTAL	$ 38,461.55

RESERVE ACCOUNT

Balance at January 1, 1964	$ 2,440.93
Deposited by municipality	2,391.00
Interest Earned	184.54
	$ 5,016.47
Less Expenditures	-
Balance at December 1, 1964	$ 5,016.47

LONG TERM DEBT: (Total Capital Cost)	$126,918.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ -
Debt Retirement	4,779.43
Reserve	1,527.00
Interest Charged	14,123.97
TOTAL	$ 20,430.40

RESERVE ACCOUNT

Balance at January 1, 1964	$ -
Deposited by municipality	1,527.00
Interest Earned	31.29
	$ 1,558.29
Less Expenditures	-
Balance at December 1, 1964	$ 1,558.29

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	4575.09	2793.32		172.58	824.03		78.49		17.75	596.06	92.86
FEB	3834.04	2793.32		151.75		224.03	314.09	51.42	67.48	231.95	
MARCH	4359.15	3229.58		159.86	841.35	(350.00)	200.64	3.70	33.48	240.54	
APRIL	4915.90	2943.72		438.86	812.00	224.03	371.74		48.00	77.55	
MAY	5691.08	4415.58		105.66	824.79	(350.00)	245.76		157.46	201.25	90.58
JUNE	5218.24	3317.36		156.58	694.89	574.03	156.05		59.28	260.05	
JULY	4235.91	2943.72		17.98	694.84		178.81	125.24	55.27	220.05	
AUG	5558.41	2943.72		140.64	1352.88		178.62		85.64	748.25	108.66
SEPT	3054.91	2943.72		13.56			27.62			70.01	
OCT	4572.59	2943.72	87.00	20.46	684.51		248.02		179.80	409.08	
NOV	5182.01	2943.72	120.24	46.66	1325.36		149.41		247.69	267.65	81.28
DEC	6621.12	4415.58		77.76	861.92	(254.92)	660.75		69.26	790.77	
TOTAL	57818.45	38627.06	207.24	1502.35	8916.57	67.17	2810.00	180.36	1021.11	4113.21	373.38

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $1863.50

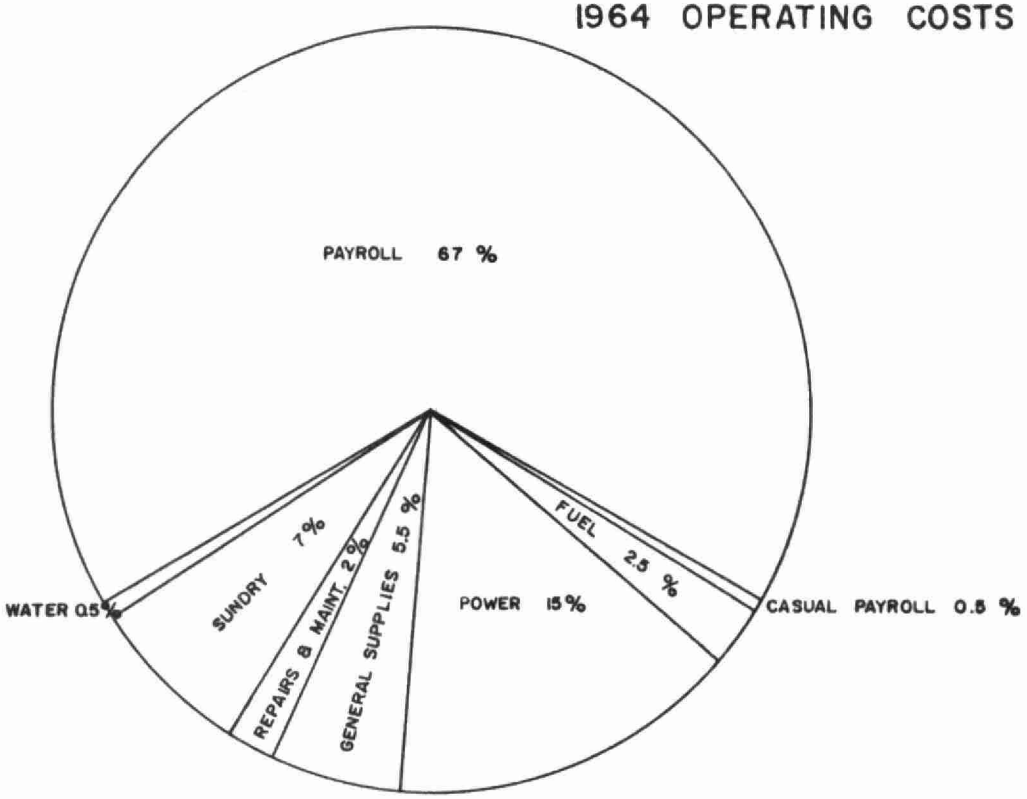
BRACKETS INDICATE CREDIT

YEARLY COSTS

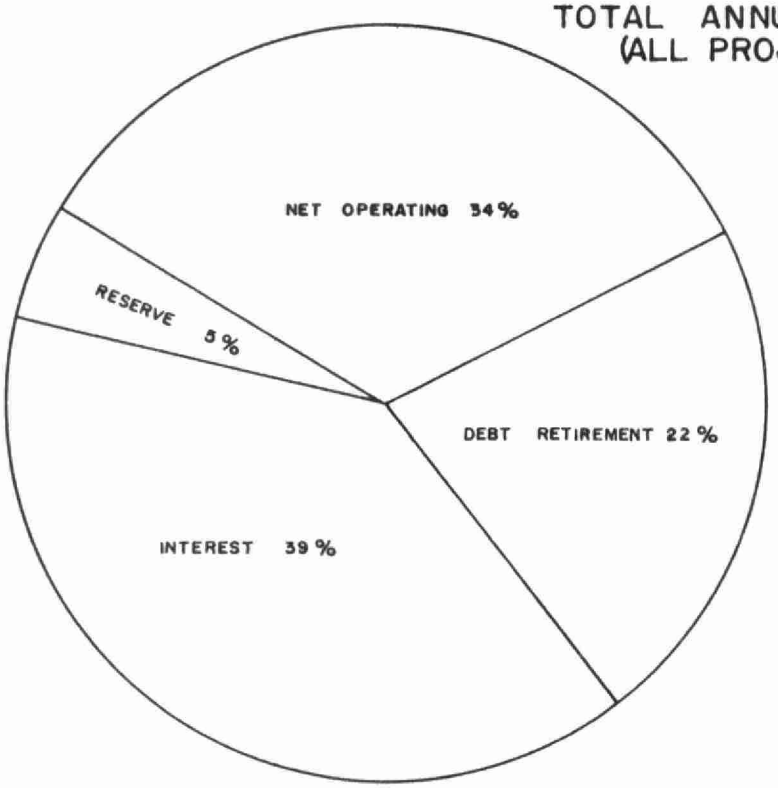
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1962	297.053	56,400.48	* 14.70	189.86	22 CENTS
1963	336.397	60,754.91	15.72	180.60	21 CENTS
1964	425.527	57,818.45	12.95	135.88	17 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS



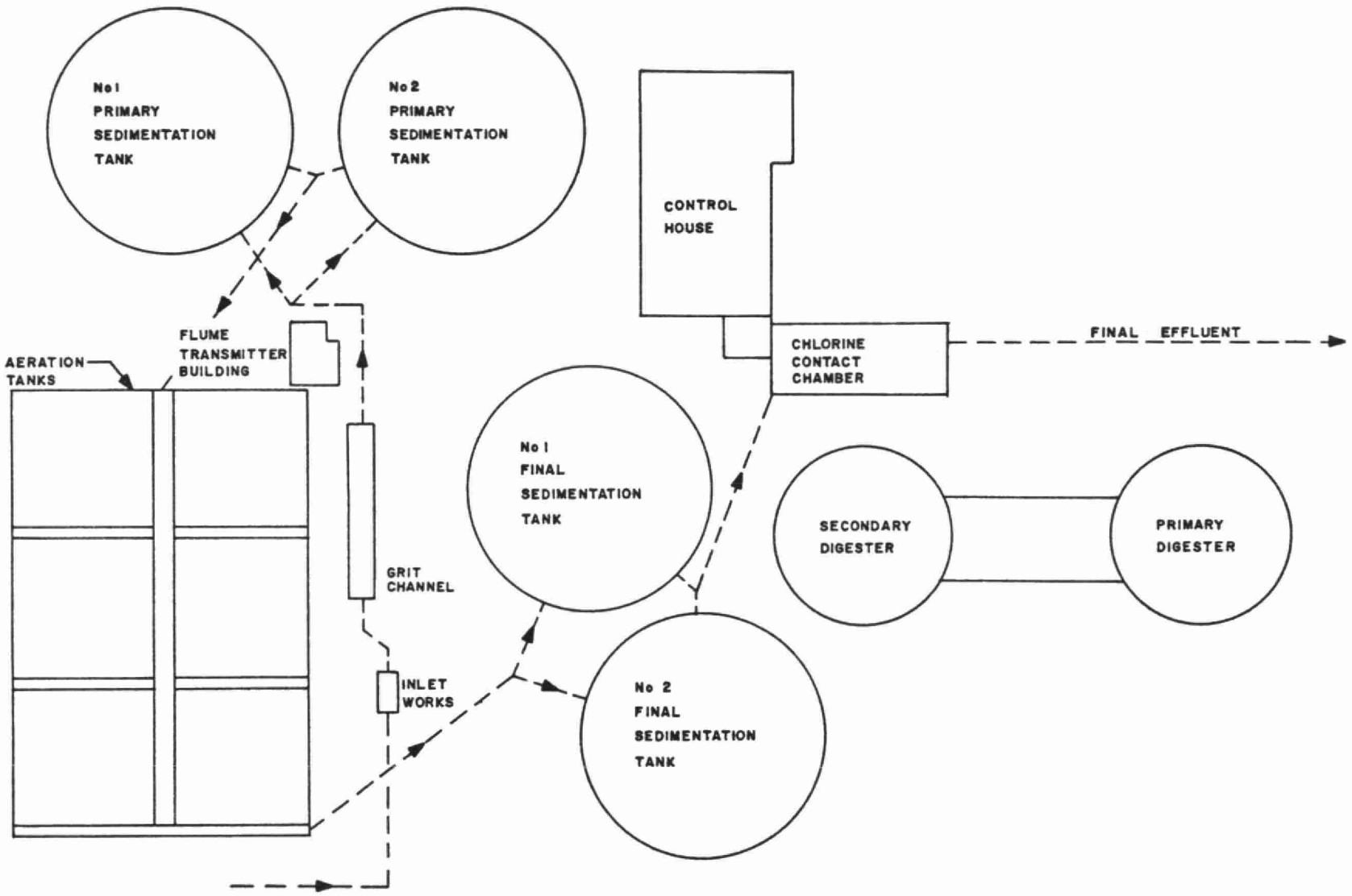
TOTAL ANNUAL COST (ALL PROJECTS)



Technical Section

FLOW CHART

WEST SIDE PLANT



Design–Data

WEST SIDE PLANT

GENERAL

Type of Plant - Activated sludge process.

Design Population - 9,000 persons.

Per Capita Flow - 100 gallons per capita per day.

Design Plant Flow - Dry weather flow 900,000 gallons per day (DWF). Combined flow is 3,600,000 gallons per day (4 DWF).

Five Day BOD -

Raw Sewage - 225 PPM

Removal - 93%

Suspended Solids -

Raw Sewage - 300 PPM

Removal - 93%

INFLUENT SEWER

14 inch diameter forcemain.

SCREENS

Located before the grit channels and manually cleaned. Two bar screens with 1 inch spaces.

GRIT CHANNELS

Two parallel units.
Length - 40 ft. 4 in. - Width - 1 ft. 10 in.
Cross-Section area - 1.67 square feet.
Volume - 67.3 cubic feet = 419 gallons.
Detention at Design Flow (DWF) - 0.67 minutes.
Velocity - 1 ft. per second.
A grit trough is provided which discharges to a wheelbarrow.

PRIMARY SEDIMENTATION TANKS

Two units, circular.
Size - 50 ft. diameter by 9 ft. liquid depth.
Volume (2 units) - 35,300 cubic feet = 220,000 gallons.
Detention at Design Flow - 5.9 hours.
Surface Settling Rate - 229 gallons per square foot of tank per day.
Weir Overflow Rate - 2860 gallons per lineal foot of weir per day.
Equipment - Dorr-Oliver-Long Limited.

RAW SLUDGE PUMPS

Two - Carter plunger type 75 GPM at a TDH of 30 feet and driven by 3 HP General Electric motors.

AERATION SECTION

Type - surface aeration.

Six units square.
Size of Each Unit - 30 ft. x 30 ft. x 10.5 ft. (normal W. L.)

Volume (6 units) - 52,300 cubic feet = 326,000 gallons.
Detention at Design Flow = 8.7 hours.
Detention at Design Flow - 6.7 hours (including 30% return sludge).
BOD Loading - 26 lbs. BOD per day per 1,000 cubic feet of aerator (assuming 35% BOD reduction in the primary).
Equipment - Ames Crosta Mills Limited.

FINAL SEDIMENTATION TANKS

Two units, circular.
Size - 45 ft. diameter by 8 ft. liquid depth.
Volume (2 units) - 25,500 cubic feet = 159,500 gallons.
Detention at Design Flow - 4.24 hours.
Surface Settling Rate - 282 gallons per square foot of tank per day.
Weir Overflow Rate - 3,200 gallons per lineal foot of weir per day.
Equipment - Ames Crosta Mills Limited.

ACTIVATED SLUDGE PUMPS

Three - Ames Crosta pumps rated at 315 GPM at a TDH of 30 feet and driven by 7.5 HP Brooks Huddersfield motors.

CHLORINE CONTACT CHAMBER

One unit - rectangular
Volume - 16,060 cubic feet = 100,000 gallons.
Contact Period at Design Flow - 16 minutes.

CHLORINATORS

Storm Flow Chlorinator - Wallace and Tiernan series A-731, V-notch.
Main Flow Chlorinator - Wallace and Tiernan series A-731, V-notch.
Maximum capacity of each chlorinator is 400 lbs. of chlorine per day.

DIGESTERS

Two units, one heated circular primary with floating cover and one unheated circular secondary.
Size of Primary - 35 ft. diameter by 22 ft. depth.
Volume of Primary - 21,200 cubic feet.
Capacity of Primary - 2.34 cubic feet per capita.
Mixing of Primary - Dorr draft tube mixer.
Operating Temperature - for the primary is 90° - 95° F. accomplished by a spiral heat exchanger.
Size of Secondary - 30 ft. diameter by 19 ft. depth.
Volume of Secondary - 13,400 cubic feet.
Capacity of Secondary - 1.49 cubic feet per capita.
Loading (2 units) - 2.18 lbs. of solids per cubic feet of tank per month.
Equipment - Dorr-Oliver-Long Limited.

HEAT EXCHANGER

One No. 25 spiral heat exchanger manufactured by Dorr-Oliver capable of transferring 200,000 BTU's per hour from the hot water to the sludge.

SLUDGE RECIRCULATING PUMPS

Two - Wemco sludge recirculating pumps rated at 62.5 GPM at a TDH of 40 feet driven by 5 HP General Electric motors.

SLUDGE TRANSFER PUMP

One Carter duplex plunger pump rated at 125 GPM.

MISCELLANEOUS EQUIPMENT

Boiler is a Cleaver-Brooks, rated at 500,000 BTU's per hour, operating on digester gas with natural gas standby.

Boiler Water Recirculating Pump - Ingersoll 33.4 GPM at a TDH of 32 feet driven by a 3/4 HP Doerr electric motor.

Building Hot Water Circulating Pump - Armstrong, 1 1/2 inch, driven by a 1/6 HP motor.

Froth Spray Pump - driven by a Westinghouse 10 HP motor.

Digester Building Sump Pump - 1 Smart-Turner 20 GPM at a TDH of 20 feet driven by a 1/2 HP General Electric motor.

Administration Building Sump Pump - 1 Smart-Turner 20 GPM at a TDH of 20 feet driven by a 1/2 HP General Electric motor.
Digester Gas Booster Pump - 1 Rootes-Connersville positive displacement pump driven by a 1/2 HP General Electric motor.

FLOW MEASUREMENT

Main sewage flow.
Sewage to aeration.
Total activated sludge.
Return activated sludge.

DESIGN DATA - EAST SIDE PLANT

GENERAL

Type of Plant - Activated sludge without primary tanks.

Design Plant Flow - 850,000 gallons per day.

GRIT CHANNELS

Two parallel channels, 15 ft. long. Each channel equipped with bar screens at the head of the channel.

COMMINUTION

One comminutor - Jones Atwood Limited with a .75 HP motor.

AERATION SECTION

Four units, square. Each unit 30 ft. x 30 ft. x 16 ft.
Volume (four units) 44,200 cubic feet = 276,000 gallons.
Retention period - 7.8 hours.
Retention period - 6.0 hours (30% return sludge).
Equipment - Ames Crosta Mills Limited.

FINAL SEDIMENTATION TANKS

Two units, circular. Each unit 30 ft. diameter x 8 ft.
Volume (two units) 11,300 cubic feet - 70,400 gallons.
Retention period - 2.0 hours.
Surface Settling Rate - 601 gallons per square foot of tank per day.

Weir Overflow Rate - 4,520 gallons per lineal foot of weir per day.
Equipment - Ames Crosta Mills Limited.

ACTIVATED SLUDGE PUMPS

Three - Ames Crosta Mills with 3 HP motors.

DIGESTER

One unit, circular, single stage.
Size - 50 ft. diameter x 22 ft. 10 in. depth or SWD.
Volume - 44,800 cubic feet = 280,000 gallons.
Heated sludge is recirculated to maintain a temperature of approximately 90° F.
Equipment - Pacific Flush Tank.

SLUDGE RECIRCULATION PUMP

One - Fairbanks-Morse 250 GPM at 35 ft. head with a 3 HP motor.

MISCELLANEOUS EQUIPMENT

One - Water circulating pump = Armstrong with 6 HP motor.
Two - Sludge pumps - Smart-Turner 100 GPM at 27 ft. head with 3 HP motors.

FLOW MEASUREMENTS

Raw sewage meter.
Return sludge meter.

CLARKE STREET PUMPING STATION

PUMPS

Three Pulsometer vertical spindle stereophagus.

CAPACITY

No. 1 - 600 GPM at 70 ft. TDH.

No. 2 - 600 GPM at 70 ft. TDH.

No. 3 - 250 GPM at 27 ft. TDH.

MOTORS - 2

Two - 30 HP Bull.

One - 7.5 HP Bull.

CONTROLS

"Noflote" electrodes.

FRETZ PARK PUMPING STATION

PUMPS

Two Pulsometer vertical spindle stereophagus pumps.

CAPACITY

No. 1 - 750 GPM at 65 ft. TDH.

No. 2 - 750 GPM at 65 ft. TDH.

MOTORS

Two - 30 HP Bull.

CONTROLS

"Noflote" electrodes.

STANDBY ENGINE

Waukesha - Model XA-HU

Fuel is natural gas.

Process Data

GENERAL

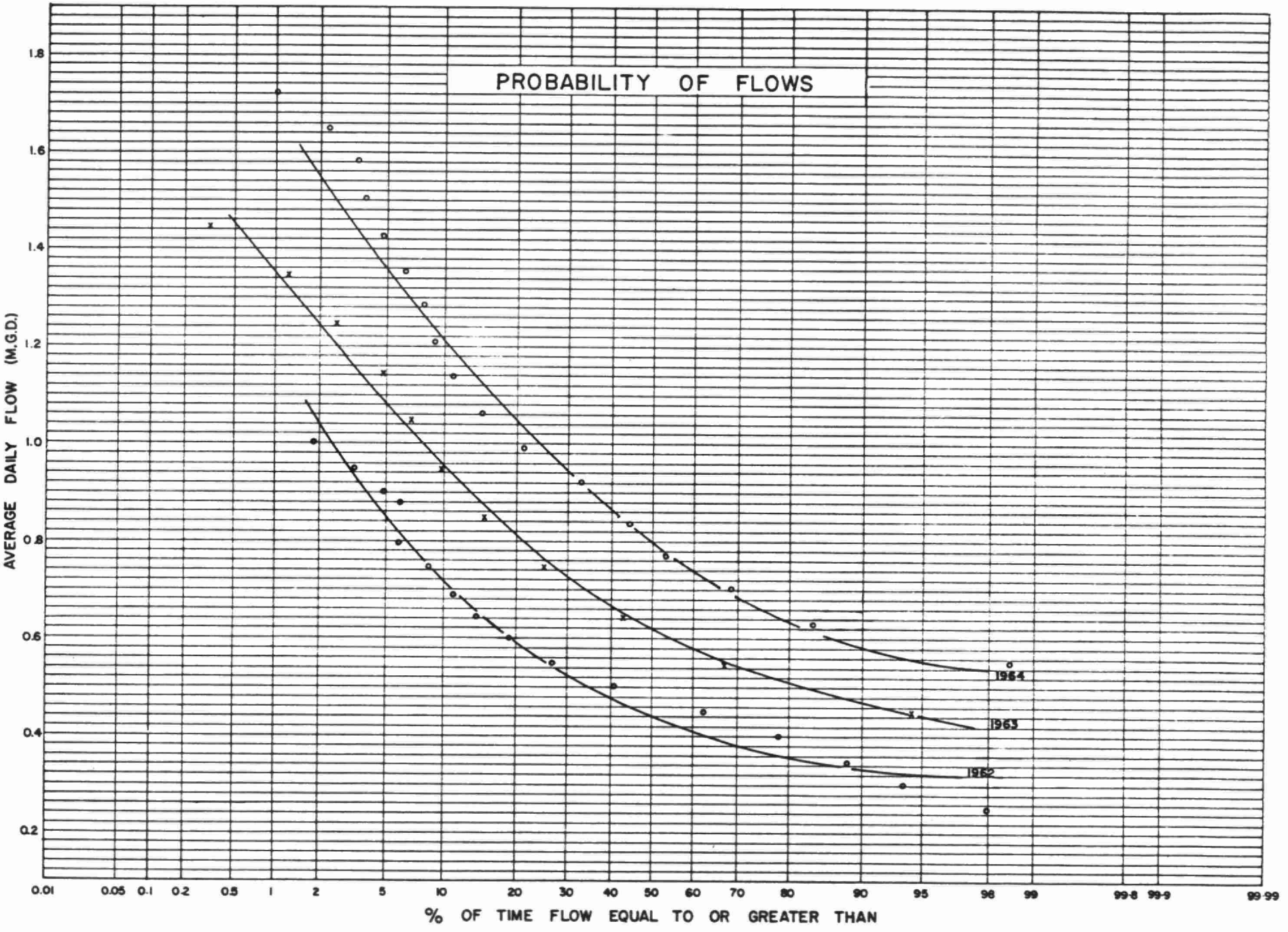
The following data provides information regarding the flows treated by the two Port Colborne Water Pollution Control Plants, the degree of treatment achieved, the digester performance and in the case of the West Side Plant the chlorine dosages required to maintain certain residuals.

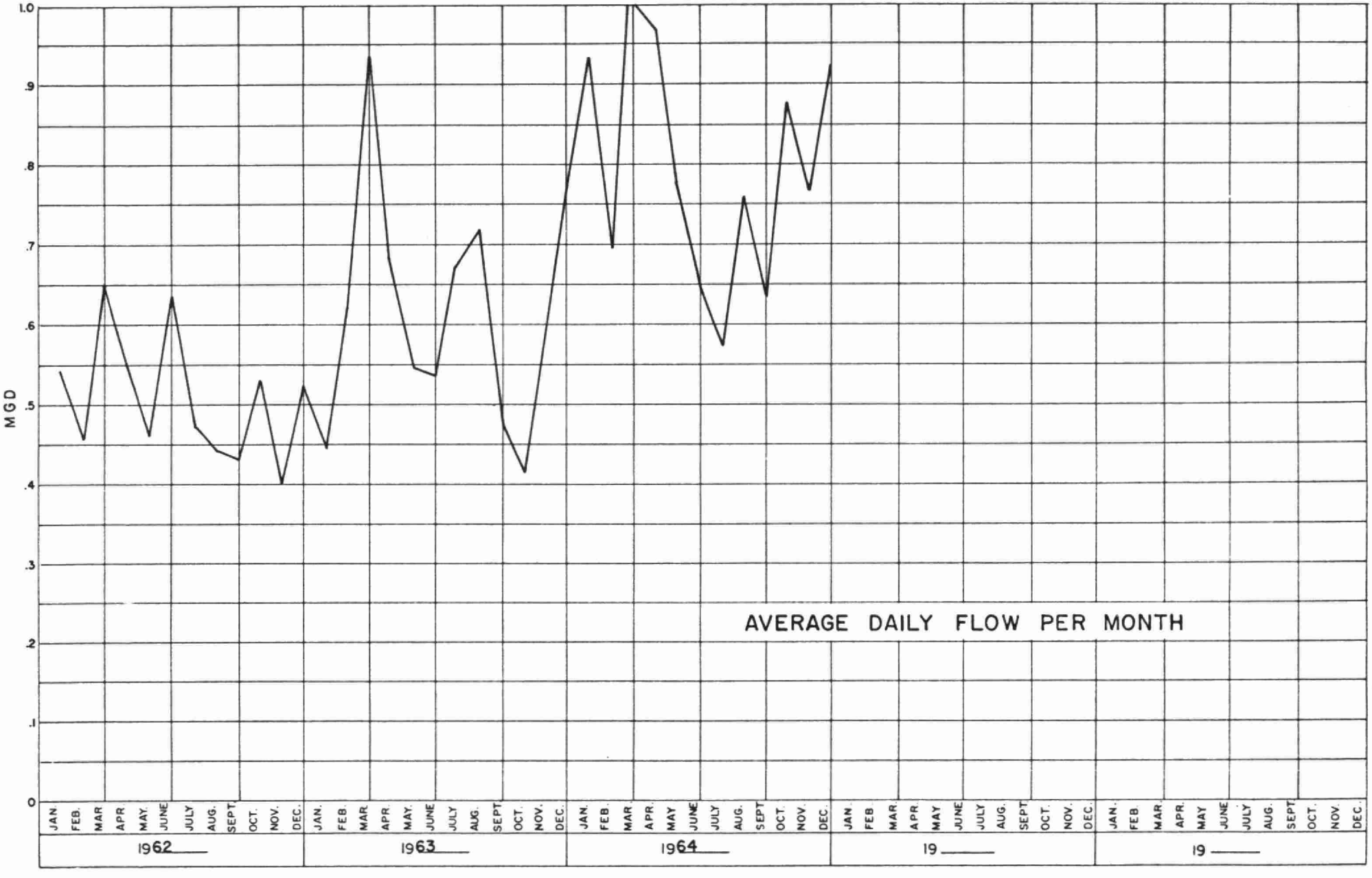
FLOW -- WEST SIDE PLANT

During 1964 a total of 294. 212 million gallons of sewage was given secondary treatment. This is an increase of approximately 30. 2% over the 1963 flow. The average daily flow of 0. 804 million gallons is approaching the design dry weather hydraulic capacity of the plant.

The maximum 24 hour daily flow of 1. 75 million gallons reaching the treatment plant occurred in March and the maximum average daily flow for one month of 1. 08 million gallons occurred in the same month.

The following table and two graphs summarize the flow data for the West Side Plant. It can be seen from the probability plot on page 26, that the plant theoretically was hydraulically overloaded approximately 35% of the time. This overloading however is not seriously affecting the degree of treatment as will be seen later in this report.

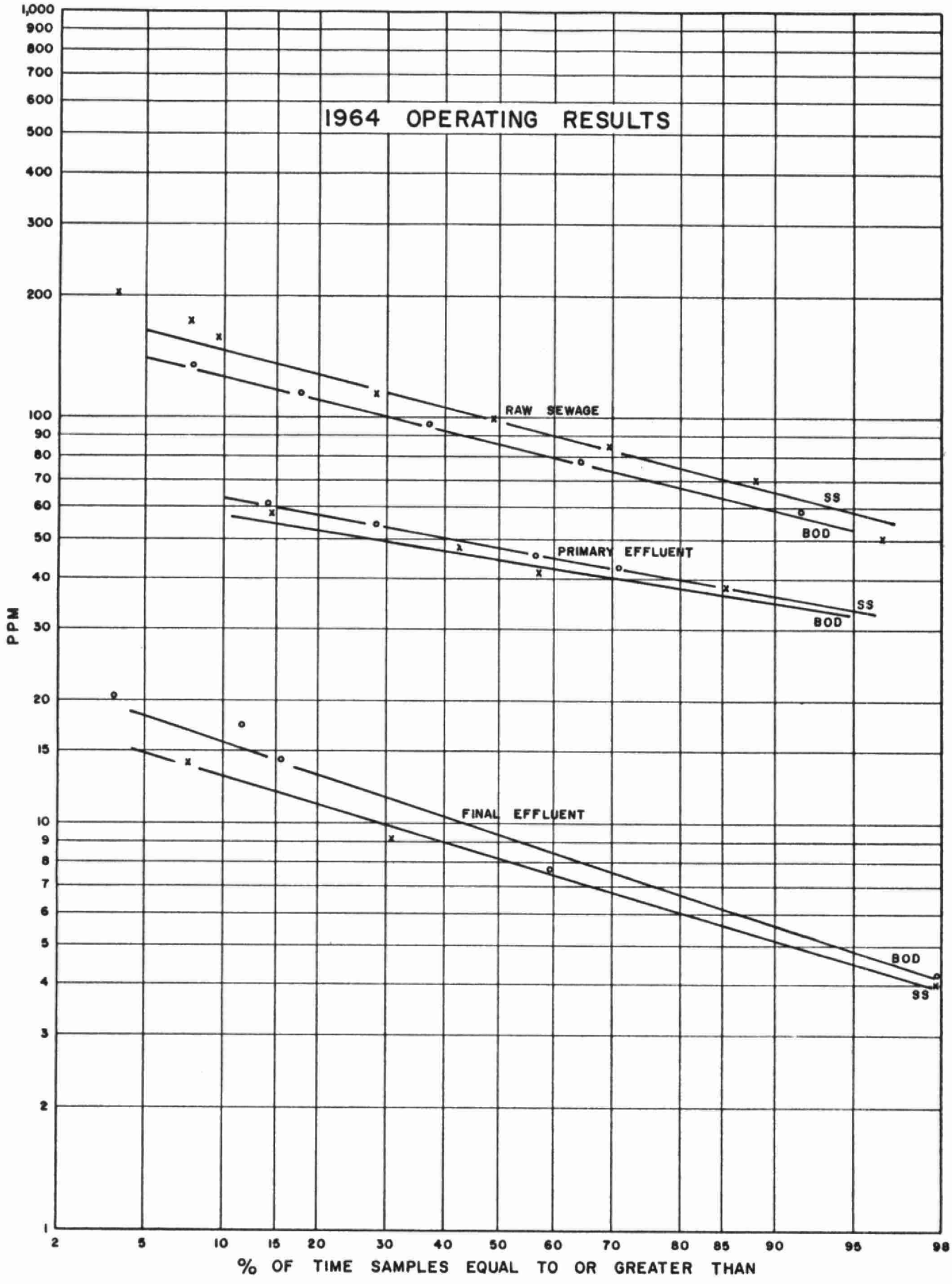

PROBABILITY OF FLOWS
AVERAGE DAILY FLOW (M.G.D.)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
% OF TIME FLOW EQUAL TO OR GREATER THAN
1964
1963
1962

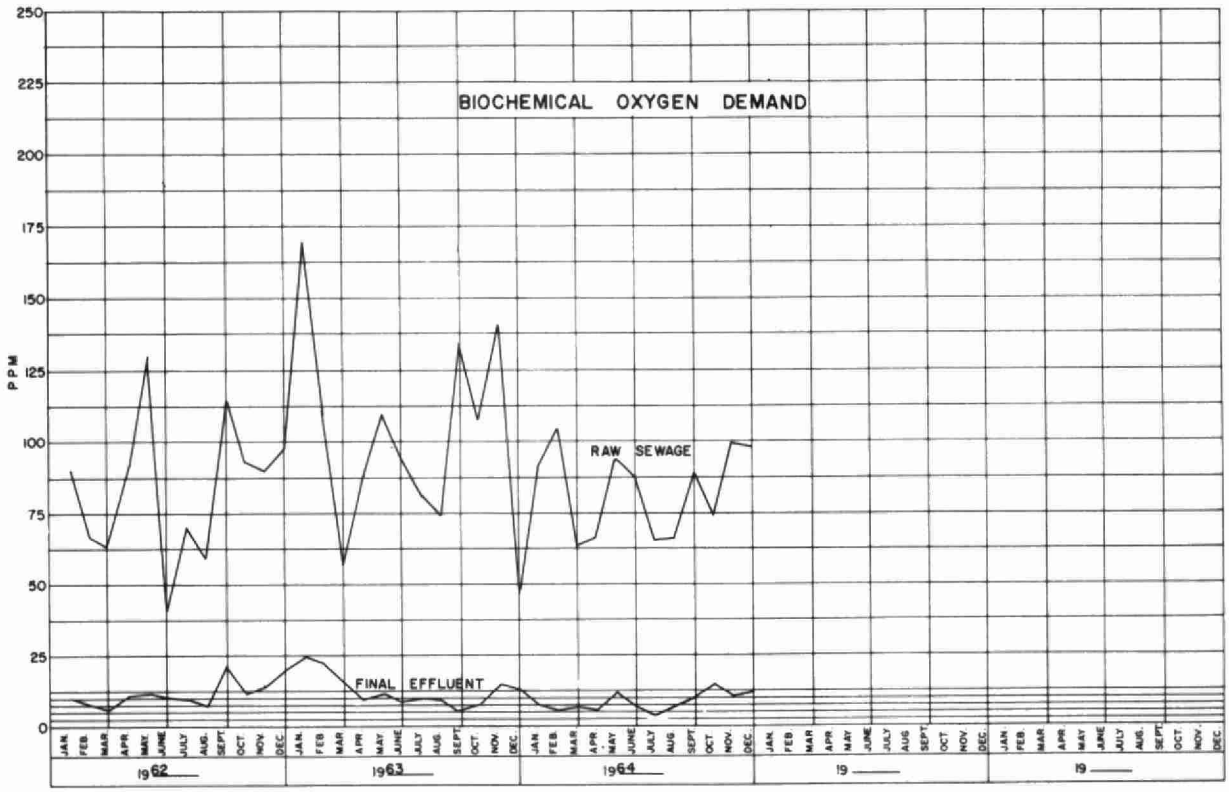

1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
MGD
AVERAGE DAILY FLOW PER MONTH
JAN. FEB. MAR APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19

FLOW SUMMARY

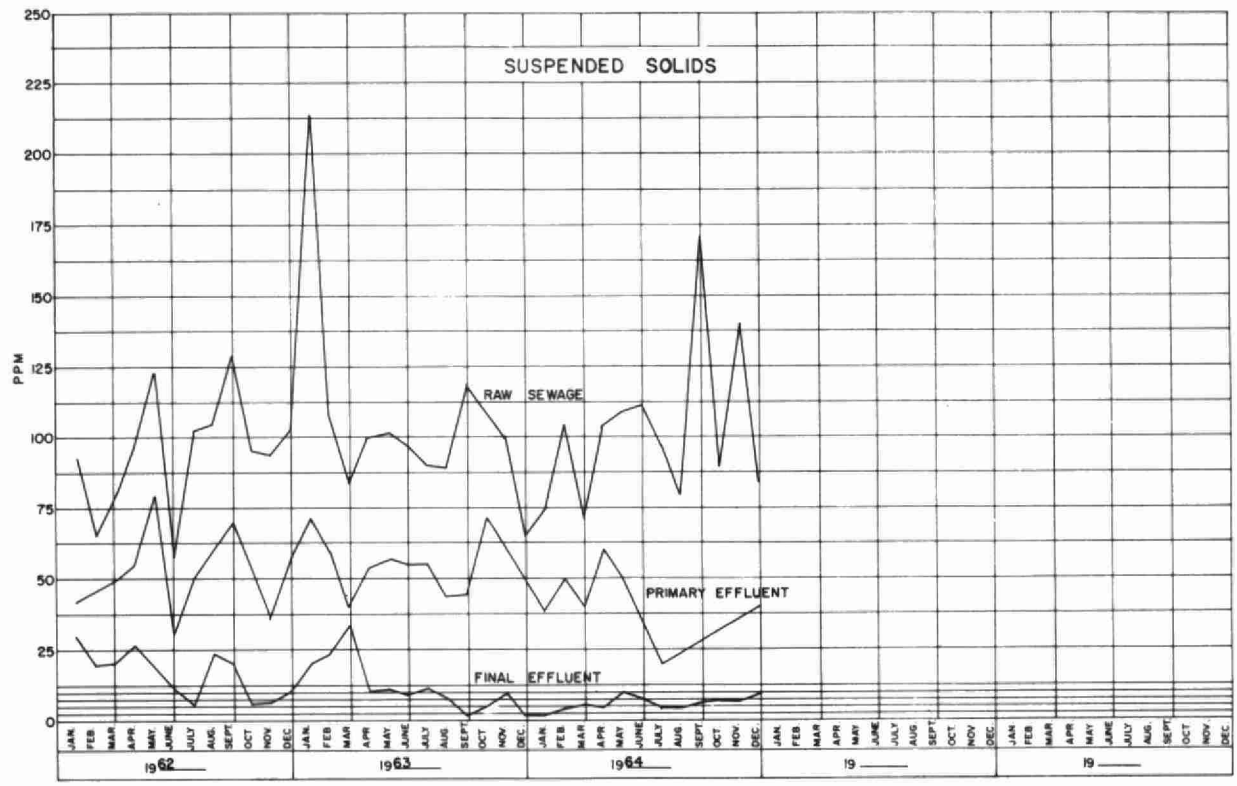
(WEST SIDE PLANT)

Month	Total Flow MG	Max. 24 hr. Flow MG	Max. Instan. Flow MG	Min.24 hr. Flow MG	Min.Instan. Flow MG
January	28.913	1.643	1.700	0.565	0
February	20.230	0.961	1.200	0.563	0.025
March	33.437	1.749	1.800	0.560	0
April	29.270	1.490	1.500	0.710	0.025
May	24.082	1.098	1.300	0.586	0
June	19.329	0.978	3,100	0.501	0
July	17.771	1.679	1.700	0.522	0
August	23.549	1.714	1.950	0.510	0.060
September	19.023	0.834	1.050	0.574	0
October	27.022	0.995	1.700	0.667	0.020
November	22.900	1.077	1.400	0.539	0
December	28.686	1.717	1.725	0.520	0
Total	294.212				
Average	24.518				


1964 OPERATING RESULTS
PPM
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
RAW SEWAGE
SS
BOD
PRIMARY EFFLUENT
SS
BOD
FINAL EFFLUENT
BOD
SS
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% OF TIME SAMPLES EQUAL TO OR GREATER THAN



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

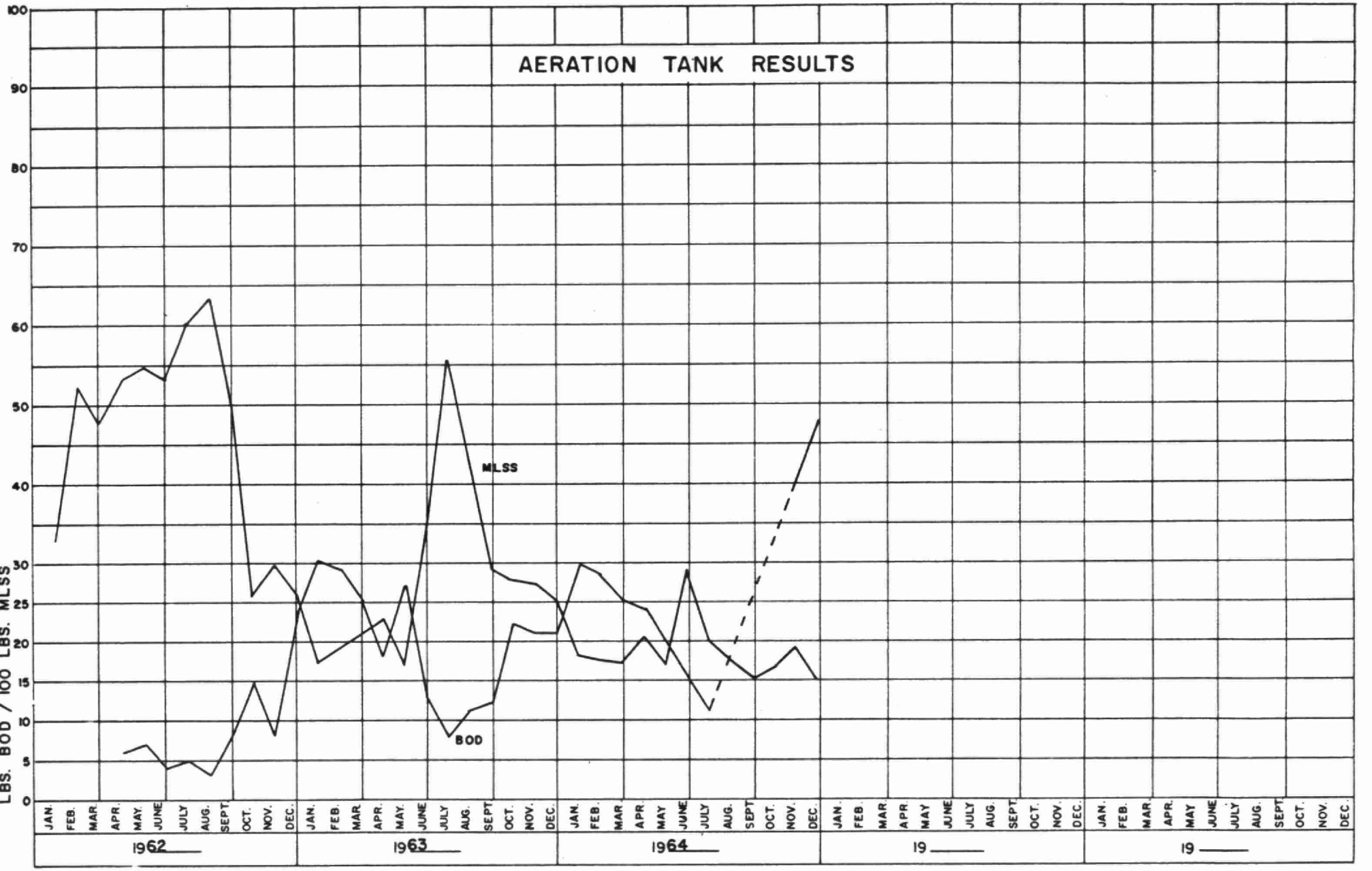
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	90	8.7	90.5	11.8	76	2	97.5	10.7	18
FEB.	104	5.7	94.5	9.9	105	4	96	10.2	12
MAR.	63	6.4	90	9.5	71	5	93	11	16
APR.	66	4.9	92.5	8.9	104	4	96	14.6	8
MAY	94	11.7	87.5	9.9	110	10	91	12	4
JUNE	88	5.7	93.5	8	112	8	93	10.1	12
JULY	66	3.4	95.0	5.6	97	4	96.0	8.3	10
AUG.	66	6.9	89.5	7.0	79	4	95.0	8.8	32
SEPT.	89	9.0	90.0	7.6	171	6	96.5	15.7	4
OCT.	71	14.0	80.0	7.7	90	7	92.0	11.2	14
NOV.	99	10	90.0	10.2	142	7	95.0	15.4	4
DEC.	98	11	88.5	12.5	84	9	89.0	10.8	-
TOTAL	-	-	-	110.3	-	-	-	142.7	134
AVG.	83	8	90.5	9.2	103	6	94.0	11.9	11

COMMENTS

The biochemical oxygen demand (BOD) and suspended solids (SS) contained in the West Side raw sewage is far below normal for sanitary sewage. For this reason even with the hydraulic load approaching DWF design the organic load on this plant is well below design.

The average removal efficiencies of 90.5% and 94.0% for BOD and SS respectively are very good considering the weak nature of the raw sewage. The final effluent exceeded the OWRC objective for secondary treatment of 15 ppm for BOD and SS only 12% and 5% of the time respectively.

The grit removal of 0.45 cu. ft. per million gallons of sewage at the West Side is below the normal amount found in most combined sewage.

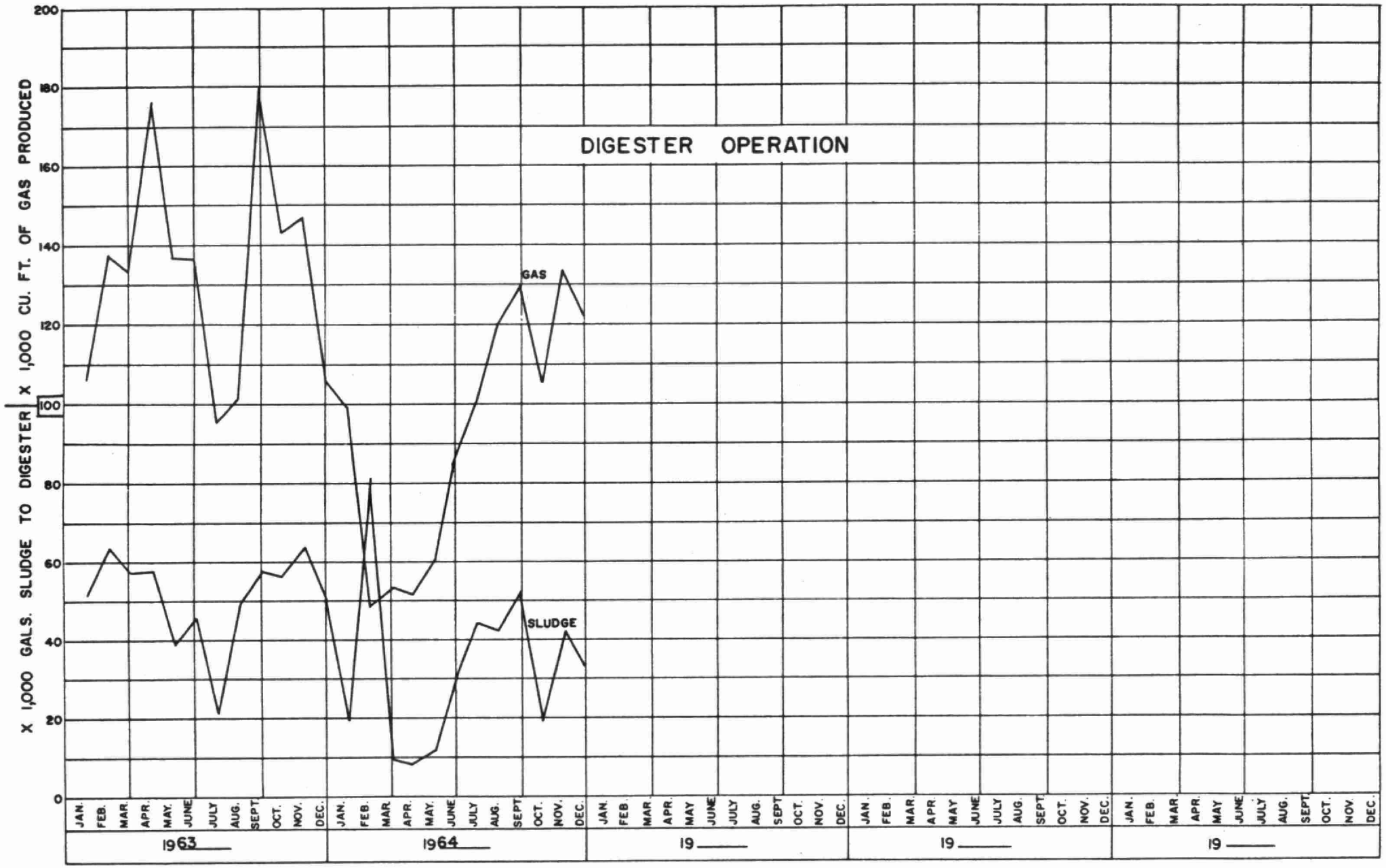

AERATION TANK RESULTS
LBS. BOD / 100 LBS. MLSS
100
90
80
70
60
50
40
30
25
20
15
10
5
0
MLSS
BOD
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
19
19

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	54	901	29	-
FEBRUARY	62	861	28	-
MARCH	32	851	25	-
APRIL	46	1031	24	-
MAY	42	843	20	-
JUNE	-	1424	-	-
JULY	29	985	11	-
AUGUST	-	866	-	-
SEPTEMBER	-	767	-	-
OCTOBER	-	842	-	-
NOVEMBER	-	953	-	-
DECEMBER	46	721	47	-
TOTAL	-	-	-	-
AVERAGE	44	920	26	-

COMMENTS

Due to the low organic loading on this plant, experience has shown that the operation of only one half of the aeration section gives the best treatment efficiency. The average food to micro-organisms ratio of 26 lbs. of BOD per 100 lbs. of mixed liquor suspended solids (MLSS) falls within the usual recommended range of 20 to 30 pounds of BOD per 100 pounds of MLSS for small plants.


DIGESTER OPERATION
X 1,000 GALS. SLUDGE TO DIGESTER
X 1,000 CU. FT. OF GAS PRODUCED
200
180
160
140
120
100
80
60
40
20
0
GAS
SLUDGE
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1963
1964
19
19
19

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	
JAN.	3.00	4.5	80	3.85	-	-	98.93
FEB.	1.31	4.4	78	1.15	-	-	46.56
MAR.	1.54	4.7	77	2.31	-	-	52.88
APR.	1.48	4.5	77	-	-	-	51.61
MAY	1.77	4.6	77	0.58	-	-	60.07
JUNE	4.79	3.9	77	4.49	-	-	87.46
JULY	7.08	3.8	78	4.81	-	-	101.02
AUG.	6.77	4.1	73	1.60	-	-	119.16
SEPT.	8.38	3.5	79	6.09	-	-	127.28
OCT.	3.02	4.9	78	1.92	-	-	106.04
NOV.	6.74	4.3	78	3.85	-	-	136.18
DEC.	5.12	4.1	80	6.09	-	-	121.96
TOTAL	51.00	-	-	36.74	-	-	1109.15
AVG.	4.25	4.28	77.5	3.06	-	-	92.43

COMMENTS

A total of 51,000 cu. ft. or 318,240 gallons of settled sludge was pumped to the digesters during 1964. This sludge, which contained an average of 4.28% solids consisting of 77.5% volatile matter, represents a total of 137,000 pounds of solids entering the digesters.

Approximately 28% of the sludge volume pumped to the digester was reduced by returning supernatant to the treatment process. This left a volume of 36,740 cu. ft. or 229,258 gallons of digested liquid sludge to be removed.

A total of 1,109,150 cu. ft. of gas was produced by the digesters to supplement the plant fuel supply. Based on a flow of 100 gallons of raw sewage per capita per day the gas produced is only about 0.4 cu. ft. per capita per day. This is considerably lower than the usual accepted range of 0.9 to 1.0 cu. ft. per capita per day for secondary treatment plants. The reason for this poor gas production is again the weak nature of the raw sewage.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	28.913	778	2.69
FEBRUARY	20.230	551	2.72
MARCH	33.437	624	1.87
APRIL	29.270	609	2.08
MAY	24.082	778	3.23
JUNE	19.329	1230	6.36
JULY	17.771	1132	6.37
AUGUST	23.549	664	2.82
SEPTEMBER	19.023	761	4.00
OCTOBER	27.022	837	3.10
NOVEMBER	22.900	524	2.29
DECEMBER	28.686	576	2.01
TOTAL	294.212	9064	-
AVERAGE	24.518	755	3.08

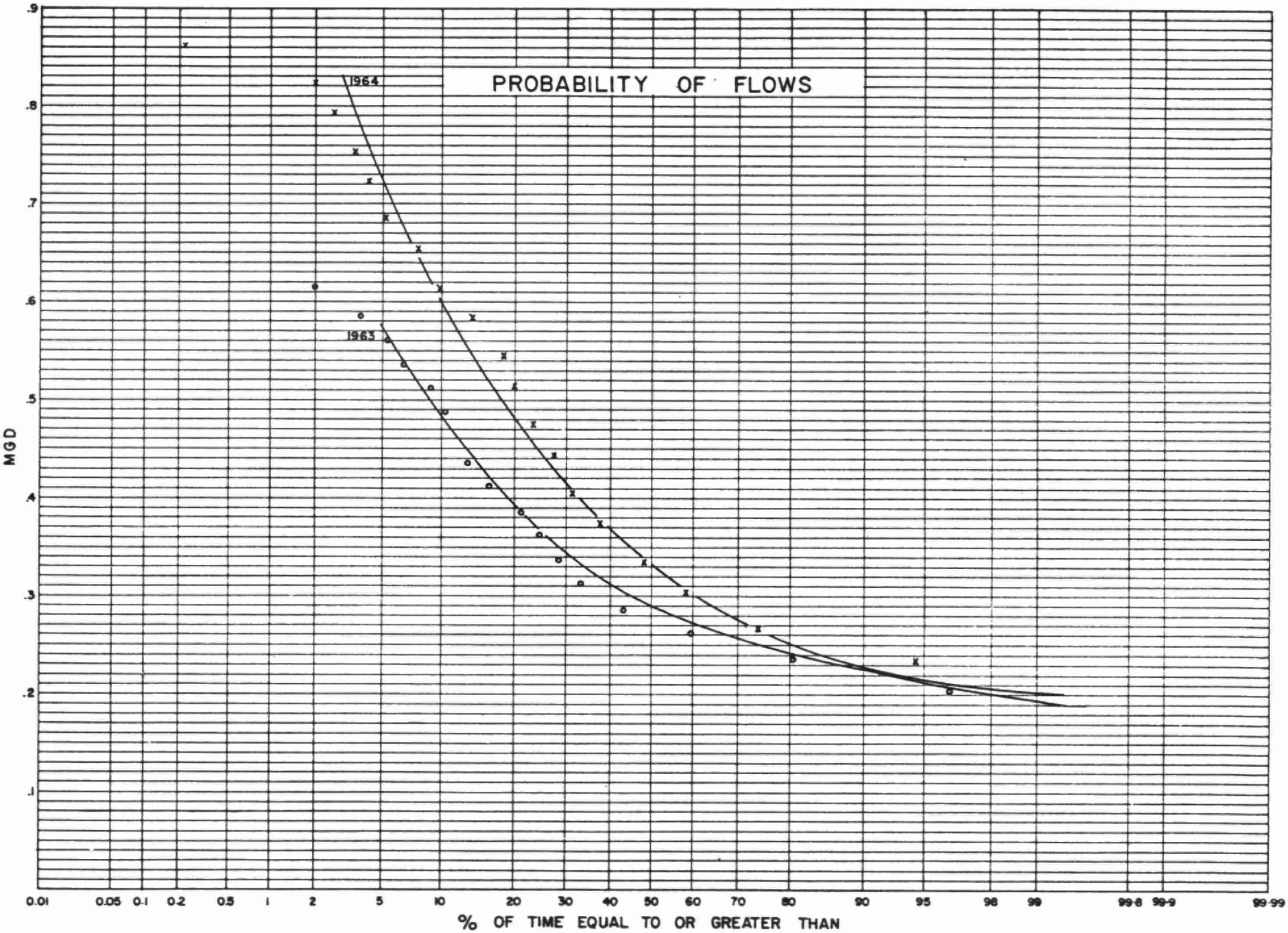
COMMENTS

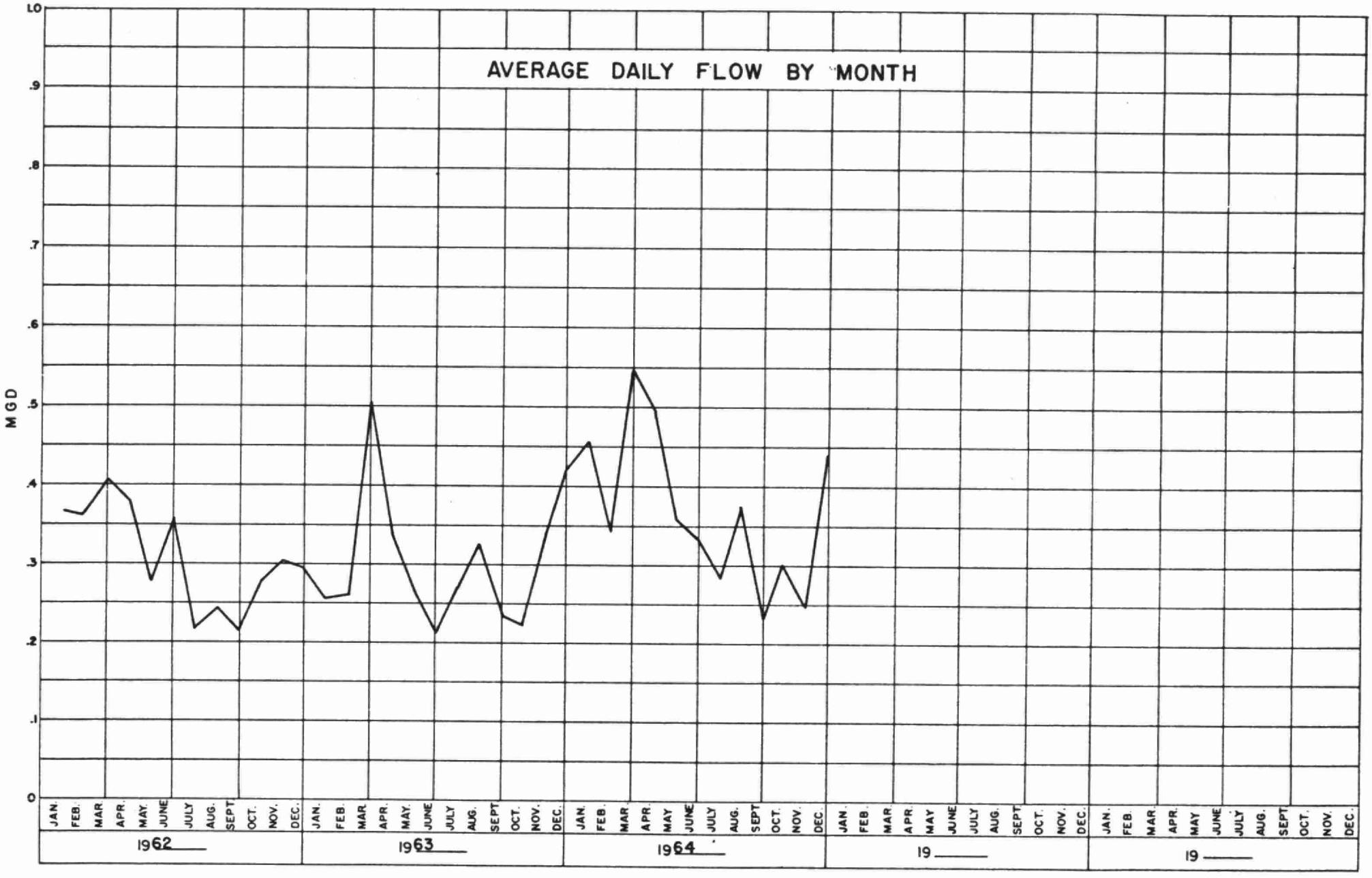
Chlorination of the final effluent is practiced for the entire year at this plant. An average residual after 15 minutes of 0.6 ppm is maintained in order to ensure disinfection of the final effluent.

FLOW -- EAST SIDE PLANT

During 1964, a total of 131.315 million gallons of sewage was given secondary treatment at the East Side plant. This is an increase in flow of approximately 18.3% over the 1963 plant flow. The average daily flow to the plant was 0.359 million gallons during 1964. The maximum daily 24 hour flow of 0.860 million gallons was treated by the plant during April and the maximum average daily flow for one month of 0.549 million gallons occurred in March.

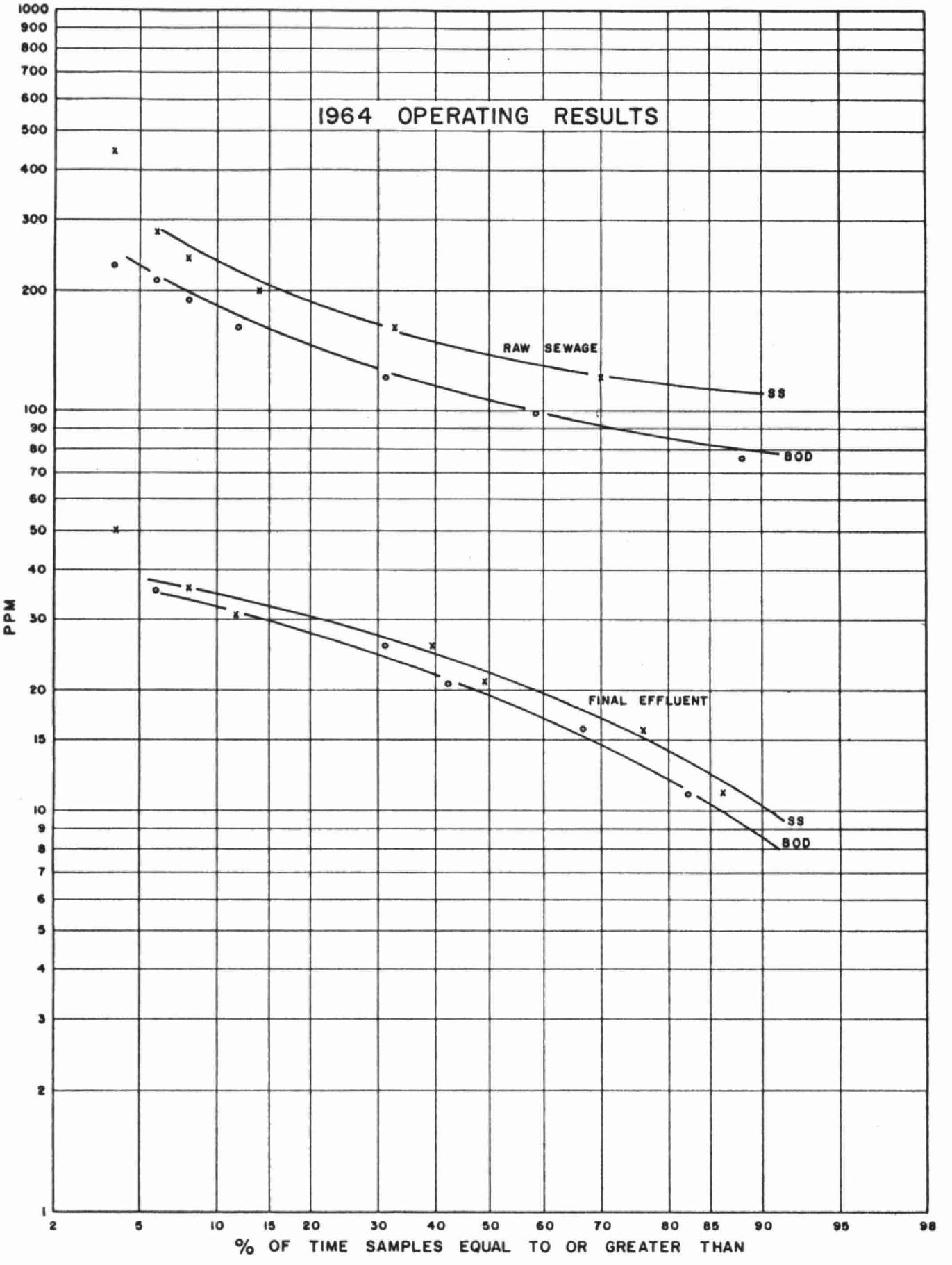
The following table and two graphs summarize the flows treated in the East Side Plant. An overflow weir in the inlet chamber permits bypassing flows in excess of the design capacity of the plant. This overflow is ahead of the flow measuring device so the actual flows reaching the East Side Plant are unknown. The overflow of sewage directly to the canal occurred for a total of approximately 1552 hours during 1964.


PROBABILITY OF FLOWS
1964
1963
MGD
.9
.8
.7
.6
.5
.4
.3
.2
.1
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
% OF TIME EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOW BY MONTH
MGD
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
19
19

FLOW SUMMARY
(EAST SIDE PLANT)

Month	Total Flow MG	Max.24 hr. Flow MG	Max. Instan. Flow MG	Max.24 hr. Flow MG	Min. Instan. Flow MG
January	14.234	0.637	1.800	0.313	0
February	9.885	0.450	1.000	0.300	0
March	17.004	0.732	0.950	0.323	0
April	14.864	0.860	1.000	0.272	0
May	11.012	0.599	0.945	0.255	0
June	8.545	0.610	0.925	0.178	0
July	8.902	0.828	0.925	0.188	0
August	11.498	0.837	0.950	0.249	0
September	7.045	0.271	0.940	0.206	0
October	7.115	0.300	0.900	0.174	0
November	7.476	0.538	0.925	0.168	0
December	13.735	0.829	0.950	0.227	0
Total	131.315				
Average	10.943				


1964 OPERATING RESULTS
RAW SEWAGE
SS
BOD
FINAL EFFLUENT
SS
BOD
PPM
% OF TIME SAMPLES EQUAL TO OR GREATER THAN
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
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2
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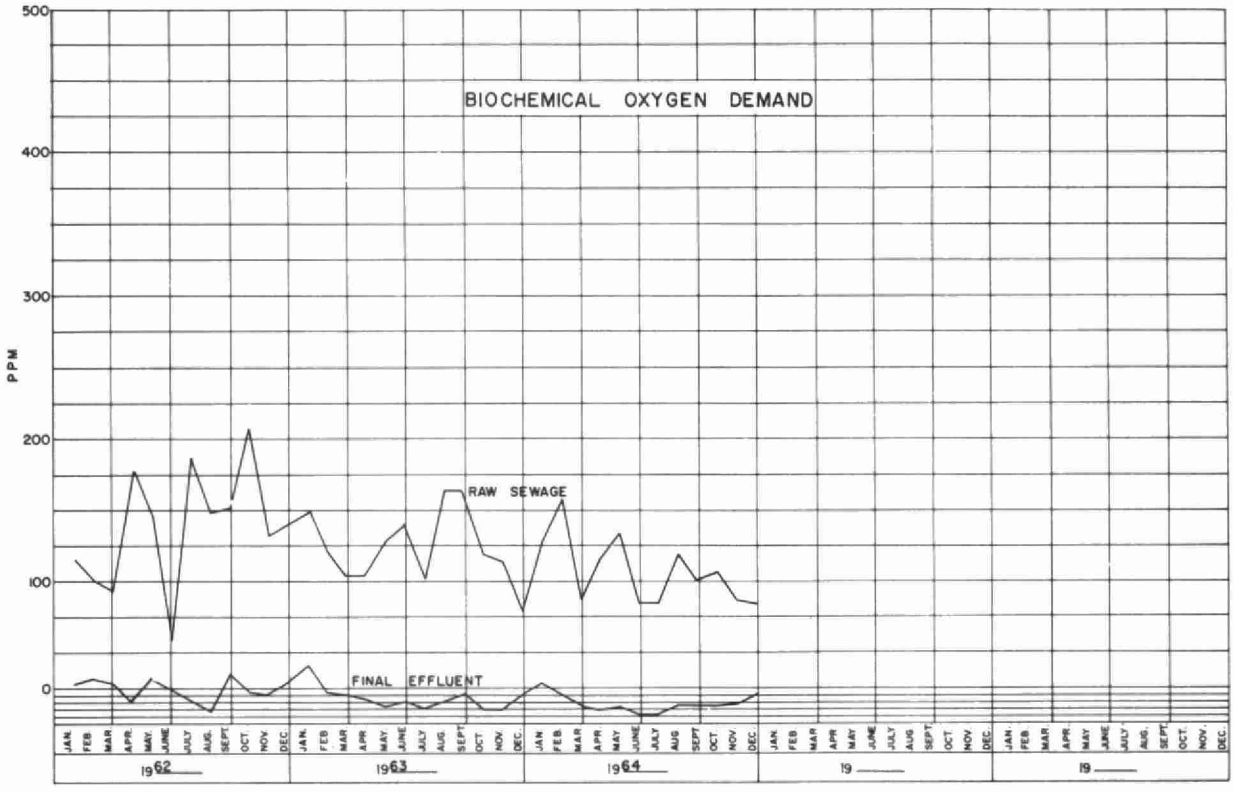
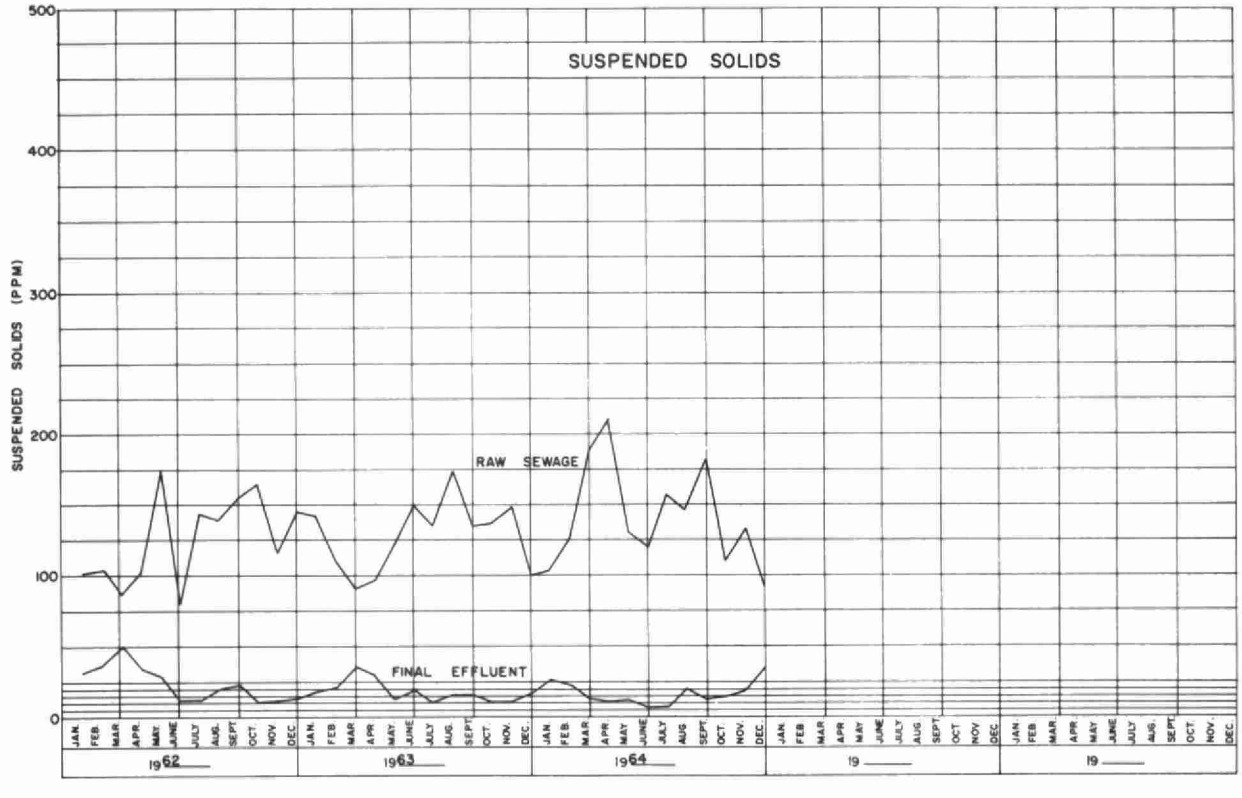
10
15
20
30
40
50
60
70
80
85
90
95
98



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

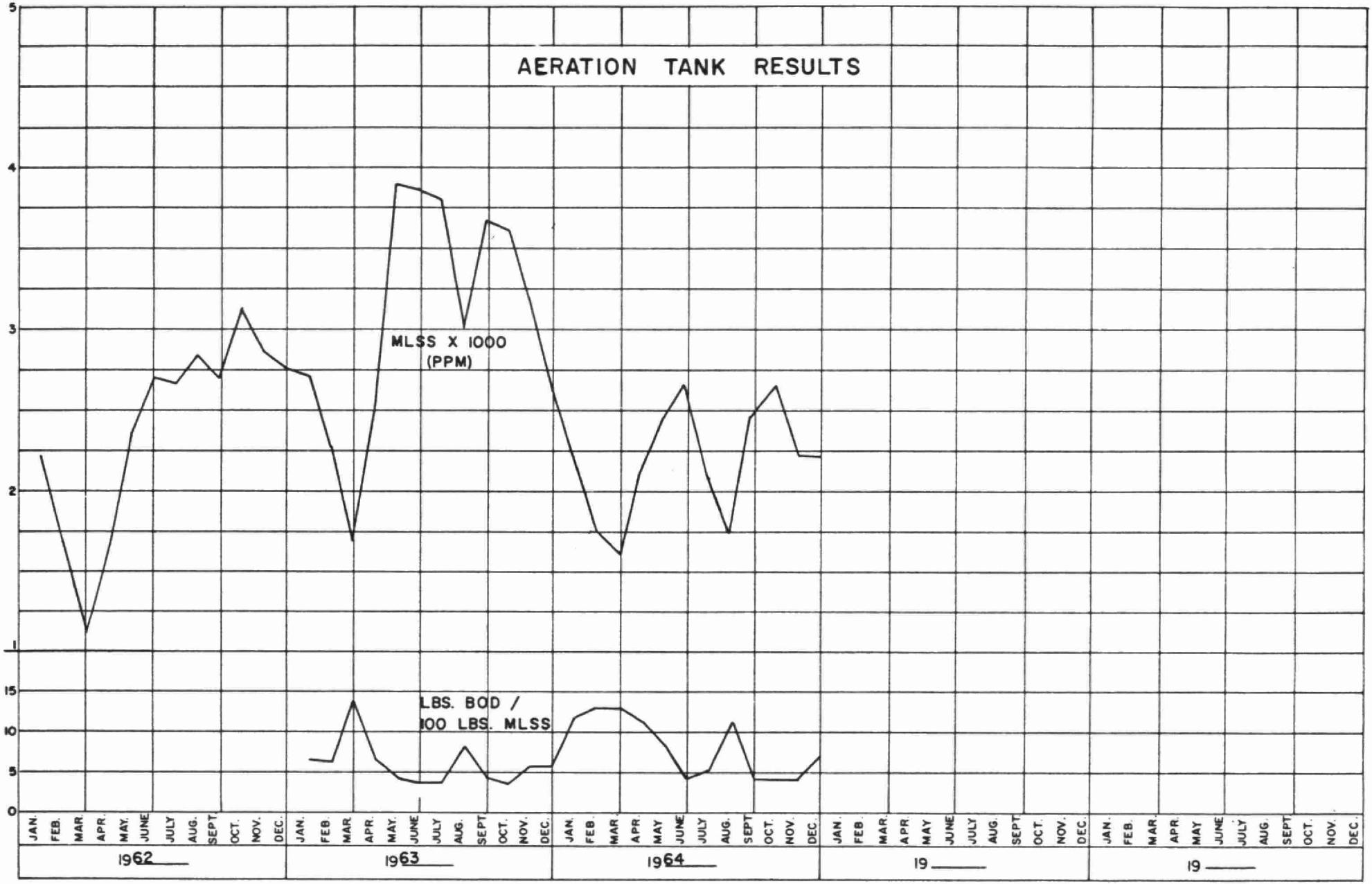
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	130	28	78.5	7.3	105	23	78	5.8	12
FEB.	149	22	85	6.3	126	28	77.5	4.8	8
MAR.	87	14	84	6.2	113	25	78	7.5	38
APR.	118	10	91.5	8	189	21	89	12.5	18
MAY	136	11.4	91.5	6.6	214	29	86.5	10.2	18
JUNE	82	7	91.5	3.2	128	10	92.0	5.0	8
JULY	87	8	91.0	3.5	122	17	86.0	4.7	45
AUG.	120	14.4	88.0	6.1	158	13	91.5	8.3	40
SEPT.	101	12	88.0	3.1	145	14	90.5	4.6	12
OCT.	109	12	99.0	3.4	184	16	91.5	6.0	10
NOV.	86	14	83.5	2.7	132	17	87.0	4.3	17
DEC.	85	21	75.0	4.4	93	35	62.5	4.0	-
TOTAL	-	-	-	61.7	-	-	-	79.4	226
AVG.	108	14	87.0	5.1	142	21	85.0	6.6	19

COMMENTS

The biochemical oxygen demand (BOD) and suspended solids (SS) contained in the East Side raw sewage is somewhat higher than in the West Side raw sewage but it is still below the normal for sanitary sewage.

The average removal efficiencies for BOD and SS of 87% and 85% respectively and the average effluent BOD and SS of 14 ppm and 21 ppm respectively although not as good as desired, are satisfactory considering the condition of the plant and the large variations in flow to which it is subjected. The graph on page 41 reveals that the final effluent exceeded the OWRC objectives 68% of the time for BOD and 76% of the time for SS.

The 1.72 cu. ft. of grit removal per million gallons of raw sewage is within the expected range for combined sewage.


AERATION TANK RESULTS
MLSS X 1000
(PPM)
LBS. BOD /
100 LBS. MLSS
5
4
3
2
1
15
10
5
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
19
19

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	130	2161	12	-
FEBRUARY	149	1766	13	-
MARCH	87	1617	13	-
APRIL	118	2100	11	-
MAY	136	2482	8	-
JUNE	82	2694	4	-
JULY	87	2103	5	-
AUGUST	120	1744	11	-
SEPTEMBER	101	2464	4	-
OCTOBER	109	2652	4	-
NOVEMBER	86	2238	4	-
DECEMBER	85	2237	7	-
TOTAL	-	-	-	-
AVERAGE	108	2188	8	-

COMMENTS

Due to the absence of primary settling tanks at this plant the large variations in flow reaching the plant tend to complicate the operation of the activated sludge process. For this reason a higher mixed liquor suspended solids (MLSS) concentration is kept in the aeration tanks than is theoretically necessary. The average food to micro-organism ratio of 8 pounds of BOD per 100 pounds of MLSS kept at this project is thus below the range of 20 to 30 pounds BOD per 100 pounds of MLSS generally accepted for optimum treatment by this type of activated sludge process.

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	
JAN.	12.42	3.0	76	6.92	-	-	72.12
FEB.	11.62	3.2	77	2.50	-	-	111.82
MAR.	12.42	3.2	75	3.46	-	-	120.26
APR.	12.02	2.8	75	-	-	-	97.88
MAY	14.34	2.6	76	6.35	-	-	104.38
JUNE	14.42	2.8	75	3.85	-	-	100.55
JULY	23.40	2.5	72	5.77	-	-	91.06
AUG.	14.90	2.5	71	0.64	-	-	65.86
SEPT.	14.42	2.5	71	5.13	-	-	69.01
OCT.	22.92	2.6	73	9.29	-	-	96.21
NOV.	13.94	2.5	76	5.13	-	-	84.03
DEC.	12.42	2.9	75	2.88	-	-	88.73
TOTAL	179.24	-	-	51.92	-	-	1101.91
AVG.	14.94	2.76	74	4.33	-	-	91.83

COMMENTS

A total of 179,240 cu. ft. or 1,118,460 gallons of settled sludge was pumped to the digester during 1964. This sludge, which contained an average of 2.76% solids consisting of 74% volatile matter, represents a total of 309,000 pounds of solids entering the digester.

Approximately 71% of the sludge volume pumped to the digester was reduced by returning supernatant to the treatment process. This supernatant return realized a considerable saving in sludge haulage costs since only 51,920 cu. ft. or 323,980 gallons of sludge were hauled from the plant.

A total of 1,101,910 cu. ft. of gas was produced by the digesters to supplement the plant fuel supply. Based on a flow of 100 gallons of raw sewage per capita per day the gas produced is approximately 0.84 cubic feet per capita per day. The probable reason that this value is slightly lower than the usually accepted range of 0.9 to 1.0 cu.ft. per capita per day is the fact that the raw sewage is relatively weak and that primary settling is not used at this plant.

CONCLUSIONS

Hydraulic Loading at West Side Plant

The West Side Plant is approaching its design hydraulic loading based on dry weather flow. The sewage reaching the plant however, is much weaker than normal DWF sewage thus indicating considerable combined sewage. The major treatment units with the exception of the grit chambers and the chlorine contact chamber are designed for four times DWF based on a combined sewage. It is thus anticipated that the future addition of sewage from the North West sewers now under construction will not cause any major process problems.

Condition of East Side Plant

The East Side Plant particularly the concrete inlet structure and aeration tank bridges, is in very poor physical condition. Work of major proportions is required to put this plant in proper condition.

Chlorination Procedures

The fact that the effluent from the West Side Plant is chlorinated 12 months of the year, 24 hours per day, but the effluent from the East Side Plant is not chlorinated at all is inconceivable. Some means of chlorinating the East Side effluent including that portion of the flow which is bypassed should be considered.

Storm Flows

The capacities of many of the pumping sta
the East Side Plant are exceeded during
thorough study of the collection system to
eliminate the access of this storm water
while in postponing expansion of facilities


ONTARIO WATER RESOURCES COMMISSION